[Title]			[Instructor]		
Environmental Data Analysis I			Kei Nishida / Eiji Haramoto/ Takashi Nakamura		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR502	1	Civil and Environmental Engineering Special Educational Program on River Basin Environmental Science	1st Semester	Fri.／I	English／ Japanese

[Outline and purpose]

Basics of environmental measurements are learned to understand what the obtained information means. Basics of data processing are also learned by using monitoring results from a model basin. Japanese and oversea students study together through group work. English is potentially used.

[Objectives]

- Master the basics of experimental methods and how to finalize the data
- Master the basics of sorting monitoring data and estimate environmental loads
- Develop leadership, cooperativeness, and internationality

[Requirements]

Basic knowledge on water chemistry, microbiology, and hydrology is desirable.

[Evaluation]

Quiz and assignments: 50%
Attitude in the class: 25%
Presentation and discussion: 25%

[Textbooks]

Nothing special

[References]

Nothing special

[Schedule]

1. Introduction (Nishida, Haramoto, Nakamura)
2. Physicochemical analysis: outline of stable isotope analysis 1 (Nishida, Nakamura)
3. Physicochemical analysis: outline of stable isotope analysis 2 (Nishida, Nakamura)
4. Physicochemical analysis: stable isotope analysis for pollutants (Nishida, Nakamura)
5. Physicochemical analysis: standard curve and calibration (Nishida, Nakamura)
6. Physicochemical analysis: finalizing data (Nishida, Nakamura)
7. Physicochemical analysis: nutrient loading (Nishida, Nakamura)
8. Physicochemical analysis: presentation (Nishida, Nakamura)
9. Microbial analysis: outline of fecal indicator microorganisms (Haramoto)
10. Microbial analysis: measurement of fecal indicator microorganisms 1 (Haramoto)
11. Microbial analysis: measurement of fecal indicator microorganisms 2 (Haramoto)
12. Microbial analysis: measurement of fecal indicator microorganisms 3 (Haramoto)
13. Microbial analysis: data analysis 1 (Haramoto)
14. Microbial analysis: data analysis 2 (Haramoto)
15. Microbial analysis: presentation (Haramoto)

[Title]			[Instructor]		
Remote Sensing and GIS I			Keiichi Masutani / Hiroshi Ishidaira / Jun Magome		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR503	1	Civil and Environmental Engineering Special Educational Program on River Basin Environmental Science	2nd Semester	Fri.／I	Japanese ／English

[Outline and purpose]

This course provides basic theories and techniques to analyze environmental information, including remote sensing, GIS.
Japanese and oversea students study together through work group on some topics. English is potentially used.

[Objectives]

To understand the principles of remote sensing and GIS.
To understand the potential use of remote sensing and GIS on environmental analysis.

[Requirements]

Basic skills of computing.

[Evaluation]

1. Report: 20%
2. Attendance and Attitude: 50%
3. Summary report: 30%

[Textbooks]

Using original documents.

[References]

[Schedule]

1. Introduction
2. Basic concept of remote sensing
3. Basic theory of remote sensing
4. Exercise (1): handling of satellite images
5. Correction of satellite images
6. Exercise (2): geometric correction
7. Remote sensing for land
8. Exercise (3): normalized difference vegetation index (NDVI) and land-cover classification
9. Basic concept of GIS
10. Structure and preparation of GIS data
11. Exercise (4): visualization of GIS data
12. Spatial information analysis method
13. Exercise (5): spatial analyses with GIS
14. Exercise (6): spatial analyses with GIS
15. Summary

[Title]			[Instructor]		
River Basin Medicine and Engineering			Kei Nishida / Eiji Haramoto / Naoki Kondo / Zentaro Yamagata / Atsuhito Nakao		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR504	2	Civil and Environmental Engineering Special Educational Program on River Basin Environmental Science	Intensive	／	English／Japanese

[Outline and purpose]

This course is designed to provide you with a basic knowledge on the assessment of population health and health risks in the environmental context of river basins in developing countries, and its application to actual environmental interventions. The primary methodology you learn in this course is from epidemiology but this course also covers a variety of disciplines including environmental engineering, immunology, microbiology, and public health policy. You learn about the hazardous factors in physical and social environment and their potential adverse impacts on health, and the methods for the identification and quantification of those health risks. We wrap up the course with the discussion on how to apply the scientific evidence to the real world, introducing some examples such as the Health Impact Assessment framework and some interdisciplinary approaches to the management of environment and population health.

[Objectives]

- Environmental engineering: To understand the basics on environmental hazards.
- Health risk: To understand the basics on helth risk analysis.
- Immunology: To understand the basics of human immunology and the immunological responses to the pathogenic substances in the water.
- Epidemiology: To understand the basic epidemiologic designs, index on population health and health risks, the concept of bias and confounding, and basics in biostatistics.
- Public health: To understand the basics on health impact assessment.

[Requirements]

Chemistry, biology, statistic, and mathematics at university basic course level.

[Evaluation]

Quiz and assignments: 50%
Attitude in the class: 50%

[Textbooks]

Nothing special

[References]

Nothing special

[Schedule]

1. Environmental Engineering 1 (Haramoto)
2. Environmental Engineering 2 (Haramoto)
3. Environmental Engineering 3 (Haramoto)
4. Health Risk 1 (Nishida)
5. Health Risk 2 (Nishida)
6. Health Risk 3 (Nishida)
7. Immunology 1 (Nakao)
8. Immunology 2 (Nakao)
9. Epidemiology 1 (Yamagata)
10. Epidemiology 2 (Yamagata)
11. Public health 1 (Kondo)
12. Public health 2 (Kondo)
13. Public health 3 (Kondo)
14. Group discussion 1 (Nishida, Haramoto)
15. Group discussion 1 (Nishida, Haramoto)

[Title]			[Instructor]		
Advanced Hydraulics and Hydrology I			Yasushi Sakamoto / Keiichi Masutani / Hiroshi Ishidaira / Yutaka Ichikawa		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR506	2	Civil and Environmental Engineering Special Educational Program on River Basin Environmental Science	1st Semester	Thu.／I	Japanese／English

[Outline and purpose]

The aim of the lecture is to learn mechanism and modeling of water flows. The lecture starts from describing basic equations of fluid motion, followed by 1-dimensional water flow equations and storage type water dynamics modeling. The lecture deals with not only theoretical description of water flow modeling but also its numerical solution technique. The topics treated in the lecture are crucial for understanding water flows and river basin environmental science. The lecture is mainly given in Japanese while English is also used when needed.

[Objectives]

1. To understand basic equations of fluid motion and their derivation.
2. To understand 1-dimensional open channel flow equations and their derivation.
3. To understand kinematic wave model equations and their derivation.
4. To understand storage type water dynamics model and their derivation.
5. To understand basic of numerical solution technique for water flow models.

[Requirements]

Basic knowledge on hydraulics, hydrology and calculus.

[Evaluation]

Report: 40%
Final exam: 40%
Attendance and Attitude: 20%

[Textbooks]

[References]

[Schedule]

1. Introduction
2. Basic equations of fluid motion
3. Basic equations of material transport
4. Runoff process and water quality
5. Vertical movement of soil water and solute transport
6. Groundwater flow and solute transport
7. River flow process
8. Evapotranspiration: theory
9. Evapotranspiration: model
10. River basin hydrological model: conceptual model and lumped model
11. River basin hydrological model: distributed model
12. Modeling of water use and water control
13. Water resources in Japan
14. Water resources in the world
15. Summary

[Title]			[Instructor]		
Advanced Water Quality Assessment			Yasushi Sakamoto / Futaba Kazama / Kei Nishida / Eiji Haramoto		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR507	2	Civil and Environmental Engineering Special Educational Program on River Basin Environmental Science	2nd Semester	Fri.／II	English／Japanese

[Outline and purpose]

Environmental issues and the applied methodologies are outlined specifically on terrestrial environments such as groundwater, river or lake. Natural and human-induced water contents, estimations of pollutant load and health risk/guideline, modeling water quality incorporated with infiltration/flow/runoff processes are discussed. English is potentially used.

[Objectives]

- Understanding basic concept of water quality control and calculation of guideline values
- Understanding basic concept of water quality modelling and capable of introducing the equations
- Utilizing above knowledge to interpret real situation of water environment

[Requirements]

Basics of water quality is desirable.

[Evaluation]

Quiz and assignments: 70%
Attitude in the class: 30%

[Textbooks]

Not designated. Related literatures or research examples will be introduced when necessary.

[References]

Not designated. Related literatures or research examples will be introduced when necessary.

[Schedule]

1 Introduction (Sakamoto, Kazama, Nishida, and Haramoto)
2 Health-related items (Haramoto)
3 Outline of microbiological indicators (Haramoto)
4 Future of microbiological indicators (Haramoto)
5 Outline of living environmental items (Nishida)
6 Future of living environmental items (Nishida)
7 Methods for water quality monitoring and principle of loading estimation (Nishida)
8 Environmental impact assessment (EIA) in Japan (Sakamoto)
9 Examples of EIA: groundwater pollution (Sakamoto)
10 Tools for EIA: model simulation (Sakamoto)
11 Examples of governmental procedures for setting water quality standards: health items (Kazama)
12 Examples of governmental procedures for setting water quality standards: items for conservation of the living environment (Kazama)
13 Management of water quality and activities of citizens (Kazama)
14 Group discussion 1 (Sakamoto, Kazama, Nishida, and Haramoto)
15 Group discussion 2 (Sakamoto, Kazama, Nishida, and Haramoto)

[Title]			[Instructor]		
Advanced Environmental Treatment Technology			Futaba Kazama / Kazuhiro Mori / Tadashi Toyama		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR508	2	Civil and Environmental Engineering Special Educational Program on River Basin Environmental Science	2nd Semester	Thu.／II	English／Japanese

[Outline and purpose]

The purpose of this lecture is to learn the purification/remediation technologies for polluted soil and water. They include physicochemical technology, biological technology and ecological technology for removal of organic compounds, nutrients (nitrogen and phosphorus), heavy metals and persistent organic pollutants. In this lecture, we will learn the technologies for energy/material recovery from solid waste/wastewater.

[Objectives]

1. To understand the history, background and current situation of environmental pollution.
2. To understand the purification technology for organic pollution.
3. To understand the purification technology for nutrients (nitrogen and phosphorus) pollution.
4. To understand the purification technology for heavy metal pollution.
5. To understand the purification technology for persistent organic pollutants.
6. To understand the technology for energy/material recovery from wastes.
7. To understand the methodology for social implementation of environmental technology in Asia.

[Requirements]

It is desirable that you should have basic knowledge of chemistry, biology and environmental engineering.

[Evaluation]

1. Reports and/or short examination; evaluation point is theoretical consideration of environmental technology; 70%
2. Lecture attendance; evaluation point is active participation/attitude; 30%

[Textbooks]

[References]

[Schedule]

1. History, background and current situation of environmental pollution (Kazama, Mori, Toyama)
2. Purification technology for organic pollution: Source and type of pollution, current situation (Mori)
3. Purification technology for organic pollution: Basic of technology, leading-edge technology, future development (Mori)
4. Purification technology for nutrients (nitrogen and phosphorus) pollution: Source and type of pollution, current situation (Toyama)
5. Purification technology for nutrients (nitrogen and phosphorus) pollution: Basic of technology, leading-edge technology, future development (Toyama)
6. Purification technology for heavy metal pollution: Source and type of pollution, current situation (Kazama)
7. Purification technology for heavy metal pollution: Basic of technology, leading-edge technology, future development (Kazama)
8. Purification technology for persistent organic pollutants Source and type of pollution, current situation (Toyama)
9. Purification technology for persistent organic pollutants Basic of technology, leading-edge technology, future development (Toyama)
10. Technology for energy/material recovery from wastes: Basic of issue, current situation (Mori, Toyama)
11. Technology for energy/material recovery from wastes: Basic of technology, leading-edge technology, future development (Mori, Toyama)
12. Environmental treatment technology practice: Design, set-up and operation of reactor (Kazama, Mori, Toyama)
13. Environmental treatment technology practice: Chemical and biological analyses for reactor evaluation (Kazama, Mori, Toyama)
14. Methodology for social implementation of environmental technology in Asia: Extraction and identification of issue, discussion (Kazama, Mori, Toyama)
15. Methodology for social implementation of environmental technology in Asia: Presentation and discussion (Kazama, Mori, Toyama)

[Title]			[Instructor]		
Seminar in River Basin Environmental Science IA			all academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR601	1	Special Educational Program on River Basin Environmental Science	1st Semester	Mon.／V	Japanese／English

[Outline and purpose]

The purpose of this practice is to secure necessary basic knowledge and technique for research. Survey, experiment and analysis concerning research subject et al. are conducted under the guidance of a group of academic supervisors. And presentation and discussion are conducted. Student must belong to a seminar group (Hydrology and hydraulic, water quality, microbiology) composed of graduate students, researchers and teachers and it's better to attend other seminar.

[Objectives]

Ultimate target that a group of academic supervisors decided

[Requirements]

Reviewing lecture relating research at undergraduate course

[Evaluation]

Integrated evaluation including interim presentation : 100%

[Textbooks]

Textbooks that a group of academic supervisors designates

[References]

References that a group of academic supervisors designates

[Schedule]

Contents that a group of academic supervisors designates

[Title]			[Instructor]		
Seminar in River Basin Environmental Science IB			all academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR602	1	Special Educational Program on River Basin Environmental Science	2nd Semester	Mon.／V	Japanese／English

[Outline and purpose]

The purpose of this practice is to secure necessary basic knowledge and technique for research. Survey, experiment and analysis concerning research subject et al. are conducted under the guidance of a group of academic supervisors. And presentation and discussion are conducted. Student must belong to a seminar group (Hydrology and hydraulic, water quality, microbiology) composed of graduate students, researchers and teachers and it's better to attend other seminar.

[Objectives]

Ultimate target that a group of academic supervisors decided

[Requirements]

Reviewing lecture relating research at undergraduate course

[Evaluation]

Integrated evaluation including interim presentation : 100%

[Textbooks]

Textbooks that a group of academic supervisors designates

[References]

References that a group of academic supervisors designates

[Schedule]

Contents that a group of academic supervisors designates

[Title]			[Instructor]		
Seminar in River Basin Environmental Science IIA			all academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR603	1	Special Educational Program on River Basin Environmental Science	1st Semester	Fri.／V	Japanese／English

[Outline and purpose]

The purpose of this practice is to secure necessary advanced knowledge and technique for research. Survey, experiment and analysis concerning research subject et al. are conducted under the guidance of a group of academic supervisors. And presentation and discussion are conducted. Student must belong to a seminar group (Hydrology and hydraulic, water quality, microbiology) composed of graduate students, researchers and teachers and it's better to attend other seminar.

[Objectives]

Ultimate target that a group of academic supervisors decided

[Requirements]

Reviewing lecture relating research at undergraduate course

[Evaluation]

Integrated evaluation including interim presentation : 100%

[Textbooks]

Textbooks that a group of academic supervisors designates

[References]

References that a group of academic supervisors designates

[Schedule]

Contents that a group of academic supervisors designates

[Title]			[Instructor]		
Seminar in River Basin Environmental Science IIB			all academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR604	1	Special Educational Program on River Basin Environmental Science	2nd Semester	Fri.／V	Japanese／English

[Outline and purpose]

The purpose of this practice is to secure necessary advanced knowledge and technique for research. Survey, experiment and analysis concerning research subject et al. are conducted under the guidance of academic supervisor and a group of academic supervisors. And presentation and discussion are conducted. Student must belong to a seminar group (Hydrology and hydraulic, water quality, microbiology) composed of graduate students, researchers and teachers and it's better to attend other seminar.

[Objectives]

Ultimate target that a group of academic supervisors decided

[Requirements]

Reviewing lecture relating research at undergraduate course

[Evaluation]

Integrated evaluation including interim presentation : 100%

[Textbooks]

Textbooks that a group of academic supervisors designates

[References]

References that a group of academic supervisors designates

[Schedule]

Contents that a group of academic supervisors designates

[Title]			[Instructor]		
Research Work in River Basin Environmental Science IA			all academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR605	2	Special Educational Program on River Basin Environmental Science	1st Semester		Japanese／English

[Outline and purpose]

Student carry out research activity such as investigation of research background according to research style under the guidance of a group of academic supervisors about each research subject selected

[Objectives]

Ultimate target that a group of academic supervisors decided

[Requirements]

Various knowledge relating research

[Evaluation]

Integrated evaluation including attitude at seminar : 100%

[Textbooks]

Textbooks that a group of academic supervisors designates

[References]

References that a group of academic supervisors designates

[Schedule]

Contents that a group of academic supervisors designates

[Title]			[Instructor]		
Research Work in River Basin Environmental Science IB			all academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR606	2	Special Educational Program on River Basin Environmental Science	2nd Semester		Japanese／English

[Outline and purpose]

Student carry out research activity such as investigation of research background according to research style under the guidance of a group of academic supervisors about each research subject selected

[Objectives]

Ultimate target that a group of academic supervisors decided

[Requirements]

Various knowledge relating research

[Evaluation]

Integrated evaluation including attitude at seminar : 100%

[Textbooks]

Textbooks that a group of academic supervisors designates

[References]

References that a group of academic supervisors designates

[Schedule]

Contents that a group of academic supervisors designates

[Title]			[Instructor]		
Research Work in River Basin Environmental Science IIA			all academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR607	2	Special Educational Program on River Basin Environmental Science	1st Semester		Japanese／English

[Outline and purpose]

Student carry out research activity such as investigation of research background according to research style under the guidance of a group of academic supervisors about to each research subject selected

[Objectives]

Ultimate target that a group of academic supervisors decided

[Requirements]

Various knowledge relating research

[Evaluation]

Integrated evaluation including interim presentation : 100%

[Textbooks]

Textbooks that a group of academic supervisors designates

[References]

References that a group of academic supervisors designates

[Schedule]

Contents that a group of academic supervisors designates

[Title]			[Instructor]		
Research Work in River Basin Environmental Science IIB			all academic supervisors		
[Code]	[Credits]	[Program]	[Semester]	[Hours]	[Language of instruction]
GTR608	2	Special Educational Program on River Basin Environmental Science	2nd Semester		Japanese／English

[Outline and purpose]

Student carry out research activity such as investigation of research background according to research style under the guidance of a group of academic supervisors about to each research subject selected

[Objectives]

Ultimate target that a group of academic supervisors decided

[Requirements]

Various knowledge relating research

[Evaluation]

Integrated evaluation including presentation of research result at master course：100%

[Textbooks]

Textbooks that a group of academic supervisors designates

[References]

References that a group of academic supervisors designates

[Schedule]

Contents that a group of academic supervisors designates